

Network analysis and machine learning for packings and dense suspensions

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We analyze the contact network features of packings near the jamming and shear thickening transitions using graph theoretical tools. We find that the 3-core is a precursor of both transitions. This k-core emerges suddenly and discontinuously around a coordination number of 3.35 in agreement with the random graph theory of k-core percolation of Pittel, Spencer and Wormald (1996). This indicates that the k-core is a useful graph feature to understand commonalities between jamming and shear thickening transitions in packings. We also review recent results to predict optimal packings of non-spherical particles using machine learning.